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ABSTRACT

This unit of instruction was designed for terminal science students whose interest and background in science are extremely limited. The course is presented through activity-centered study, and consists of selected topics in physical science including household chemistry, weather, geology and space science. The booklet lists the relevant state-adopted texts and states the performance objectives for the unit. It provides an outline of the course content and recommends suitable reference books. Fifty-four activities are described under the topic headings of rain, rocks, rockets and reactions. Each activity is related to specific performance objectives, references, and appropriate films available from the Dade County Audiovisual Center. (JR)

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AUTHORIZED COURSE OF INSTRUCTION FOR THE QUINMESTER PROGRAM

RAIN, ROCKS, ROCKETS AND REACTIONS

5334.04

SCIENCE

(Experimental)

SE016 513

DADE COUNTY PUBLIC SCHOOLS

DIVISION OF INSTRUCTION • 1971

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RAIN, ROCKS, ROCKETS AND REACTIONS

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SCIENCE
(Experimental)

Written by Tom Barringer
for the
DIVISION OF INSTRUCTION
Dade County Public Schools
Miami, Florida
1972

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RAIN, ROCKS, ROCKETS AND REACTIONS

COURSE DESCRIPTION

This course will consist of selected topics in physical science, presented through activity-centered study. Included are topics in household chemistry, weather, geology and space science.

ENROLLMENT GUIDELINES

This is for the terminal science student whose interest and background in science are extremely limited.

STATE ADOPTED TEXTBOOKS

1. Earth Science Curriculum Project. Investigating the Earth. Boston: Houghton Mifflin and Co., 1967.

2. Educational Services Inc. Introductory Physical Science. Englewood Cliffs, New Jersey: Prentice-Hall Inc., 1967.

3. Hibbs, Albert and Eiss, Albert. The Earth-Space Sciences. River Forest, Illinois: Laidlaw Brothers, 1971.

4. Oxenhorn, Joseph and Idelson, Michael. Pathways in Science, The Materials of Nature. New York: Globe Book Co., 1970.

5. Oxenhorn, Joseph M. Pathways in Science, Chemistry of Metals. New York: Globe Book Co., 1970.

6. Oxenhorn, Joseph M. Pathways in Science, Chemistry of Mixtures. New York: Globe Book Co., 1970.

PERFORMANCE OBJECTIVES

1. The student will discover selected factors influencing the weather.

2. Given some rock samples, the student will discuss the basic rock forms.

3. Given laboratory experience and materials, the student will produce topographic maps.

4. Given classroom opportunities, the student will identify relationships between the earth and the major planets.

5. Given published and experimental data, the student will explore selected problems of space travel.

6. Given models and laboratory opportunities, the student will identify the basic reactions in simple chemical experiments.

COURSE OUTLINE

I. Rain

A. What makes the weather?

1. Heat
2. Moisture
3. Pressure

B. How to measure weather

1. Temperature
2. Rain gauge
3. Barometer

C. How to study the weather

1. Watching the wind
2. Clouds
3. Weather maps

II. Rocks

A. Basic rock forms

1. Igneous
2. Sedimentary
3. Metamorphic

B. How to collect rocks

C. How to read topographic and geologic maps

III. Rockets

A. Astronomy

1. Planets of the solar system
2. Sun
3. Moon
4. Stars

B. Space travel

1. Rockets
2. Navigation
3. Temperature control

IV. Reactions

A. Atoms and Molecules

1. Elements
2. Compounds
3. Parts of the atom

B. Candle chemistry

C. Water chemistry

D. Oxygen

1. Preparation
2. Properties

E. Hydrogen

1. Preparation
2. Properties

F. Carbon dioxide

1. Preparation
2. Properties

G. Acids and Bases

1. Properties
2. Test for each

H. Carbon Compounds

I. Making synthetic fibers

REFERENCES

1. Bergaust, Erik, Birth of a Rocket. New York: G. P. Putnam's Sons, 1961.

2. Branley, Franklyn M. Experiments in the Principles of Space Travel. New York: Thomas Y. Crowell Co., 1955.

3. Brent, Robert. The Golden Book of Chemistry Experiments. New York: Golden Press, 1960.

4. Davis, Ira; Burnett, John, and Gross, Wayne. Science. New York: Holt, Rinehart and Winston, Inc., 1957.

5. Forrester, Frank H. 1001 Questions Answered About the Weather. New York: Dodd, Mead and Co., 1964.

6. Gallant, Roy A. and Schuberth, Christopher J. Discovering Rocks and Minerals. Garden City, New York: The Natural History Press, 1967.

7. Pearl, Richard M. 1001 Questions Answered About the Mineral Kingdom. New York: Dodd, Mead and Co., 1962.

8. Pearl, Richard M. How to Know the Minerals and Rocks. New York: New American Library, 1955.

9. Schneider, Herman. Everyday Weather and How It Works. New York: Whittlesey House, 1961.

10. Tannehill, Ivan Ray. All About the Weather. New York: Random House, 1953.

11. Wolfe, C. Wroe, et al. Earth and Space Science. Boston: D. C. Heath and Co., 1966.

12. Zim, Herbert and Shaffer, Paul. Rocks and Minerals. New York: Golden Press, 1957.

*For additional up to date free publications on weather and space write Public Inquiries and Reports, Code FGM, NASA, Washington, D. C. 20546

ACTIVITIES

MAJOR TOPIC - Rain Activity #1

PERFORMANCE OBJECTIVE - #1

DESCRIPTION OF ACTIVITY - Show and discuss film - Unchained Goddess - Part I and Part II

LABS - 2 periods

REFERENCES - Dade County AV#1-30382, Part I - AV#1-30384, Part II

MAJOR TOPIC - Rain Activity #2

PERFORMANCE OBJECTIVE - #1

DESCRIPTION OF ACTIVITY - Discuss how to make a rain gauge. Set up one or two at school. Have the students set up as many as possible at home.

LABS - 2 1/2 periods

REFERENCES - Everyday Weather and How It Works - pp. 149-154

MAJOR TOPIC - Rain Activity #3

PERFORMANCE OBJECTIVE - #1

DESCRIPTION OF ACTIVITY - Show and discuss film - What Makes Rain?

LABS - 1/2 period

REFERENCES - Dade County AV#1-02141, 10' C

MAJOR TOPIC - Rain Activity #4

PERFORMANCE OBJECTIVE - #1

DESCRIPTION OF ACTIVITY - Place a large beaker (600ml) over a small beaker (50ml) of hot water. Observe the moisture forming on the inside of the large beaker. Repeat using a cube of ice on top the inverted large beaker.

LABS - 1/2 period

MAJOR TOPIC - Rain Activity #5

PERFORMANCE OBJECTIVE - #1

DESCRIPTION OF ACTIVITY - Use one jar of cold air with smoke in it; and one jar of hot air (clear). Put the two jars together and observe the cold or heavier air settle to the lower jar.

LABS - 1/2 period

REFERENCES - Everyday Weather and How It Works - pp. 34-35

MAJOR TOPIC - Rain Activity #6

PERFORMANCE OBJECTIVE - #1

DESCRIPTION OF ACTIVITY - Show and Discuss film - What Makes the Wind Blow?

LABS - 1/2 period

REFERENCES - Dade County AV#1-10997, 16' C

MAJOR TOPIC - Rain Activity #7

PERFORMANCE OBJECTIVE - #1

DESCRIPTION OF ACTIVITY - Show and discuss film - What Makes Clouds?

LABS - 1/2 period

REFERENCES - Dade County AV#1-11002, 19' C

MAJOR TOPIC - Rain Activity #8

PERFORMANCE OBJECTIVE - #1

DESCRIPTION OF ACTIVITY - Show and discuss slides - Clouds and Weather

LABS - 1 1/2 periods

REFERENCES - Dade County AV#5-70019 40 (2x2)

MAJOR TOPIC - Rain Activity #9

PERFORMANCE OBJECTIVE - #1

DESCRIPTION OF ACTIVITY - Show and discuss film - Reading Weather Maps

LABS - 1/2 period

REFERENCES - Dade County AV#1-10995, 14' BW

MAJOR TOPIC – Rain Activity #10

PERFORMANCE OBJECTIVE – #1

DESCRIPTION OF ACTIVITY – Show and discuss film – How Weather is Forecast

LABS – 1/2 period

REFERENCES – Dade County AV#1-02080, 10' BW

MAJOR TOPIC – Rain Activity #11

PERFORMANCE OBJECTIVE – #1

DESCRIPTION OF ACTIVITY – Make a chart of weather map symbols and their meanings

LABS – 1 period

REFERENCES – Everyday Weather and How It Works, pp. 112-123

MAJOR TOPIC – Rain Activity #12

PERFORMANCE OBJECTIVE – #1, #5

DESCRIPTION OF ACTIVITY – Using a large bell jar and a vacuum pump reduce the air pressure until water that is at room temperature will boil.

LABS – 1/2 period

MAJOR TOPIC - Rain Activity #13

PERFORMANCE OBJECTIVE - #1, #5

DESCRIPTION OF ACTIVITY - Heat empty can (paint thinner) and close with cap. Set the can to the side and wait for it to cool. Discuss air pressure while waiting.

LABS - 1/3 period

MAJOR TOPIC - Rain Activity #14

PERFORMANCE OBJECTIVE - #1

DESCRIPTION OF ACTIVITY - Set up a mercury barometer. Explain how a mercury barometer and an aneroid barometer work.

LABS - 1 period

MAJOR TOPIC - Rain Activity #15

PERFORMANCE OBJECTIVE - #1

DESCRIPTION OF ACTIVITY - Show and discuss film - Hurricane Circuit

LABS - 1 period

REFERENCES - Dade County AV#1-10991, 23' BW

MAJOR TOPIC - Rain and Rocks Activity #16

PERFORMANCE OBJECTIVE - #1, #2

DESCRIPTION OF ACTIVITY - Set up a cloud chamber using some radio active rocks. This will illustrate cloud formation and show that some rocks will emit radioactive particles.

LABS - 1 period

MAJOR TOPIC - Rocks Activity #17

PERFORMANCE OBJECTIVE - #2

DESCRIPTION OF ACTIVITY - Show and discuss film - Rocks and Gems

LABS - 1/2 period

REFERENCES - Dade County AV#1-02160, 11' C

MAJOR TOPIC - Rocks Activity #18

PERFORMANCE OBJECTIVE - #2

DESCRIPTION OF ACTIVITY - Show and discuss film - Rocks and Minerals

LABS - 1/2 period

REFERENCES - Dade County AV#1-01976, 10' C

MAJOR TOPIC - Rocks Activity #19

PERFORMANCE OBJECTIVE - #2

DESCRIPTION OF ACTIVITY - Use identification key to identify some rock samples

Models: Florida Rocks and Minerals AV#6-00129
Igneous Rocks and Florida Minerals AV#6-00120
Sedimentary and Metamorphic Rocks AV#6-00119

LABS - 1 period

REFERENCES - Discovering Rocks and Minerals - pp. 52-53

MAJOR TOPIC - Rocks Activity #20

PERFORMANCE OBJECTIVE - #3

DESCRIPTION OF ACTIVITY - Make clay model of an island. Make horizonal slices and trace each slice on paper.

LABS - 1 period

REFERENCES - Discovering Rocks and Minerals - pp. 70-71

MAJOR TOPIC - Rocks Activity #21

PERFORMANCE OBJECTIVE - #2, #3

DESCRIPTION OF ACTIVITY - Show and discuss slides - Geology set 1, 2, 3

LABS - 1 to 3 periods

REFERENCES - Dade County AV#5-70022, 23, 24 Each 50 (2x2)

MAJOR TOPIC - Rocks Activity #22

PERFORMANCE OBJECTIVE - #2, #3

DESCRIPTION OF ACTIVITY - Show and discuss film - Rocks That Form on the Earth's Surface

LABS - 1/2 period

REFERENCES - Dade County AV#1-11019, 16' C

MAJOR TOPIC - Rocks Activity #23

PERFORMANCE OBJECTIVE - #2, #3

DESCRIPTION OF ACTIVITY - Show and discuss film - Rocks That Originate Underground

LABS - 1/2 period

REFERENCES - Dade County AV#1-30387, 23' C

MAJOR TOPIC - Rocks Activity #24

PERFORMANCE OBJECTIVE - #2

DESCRIPTION OF ACTIVITY - Weigh a rock sample very carefully. Determine its volume by water displacement method. Calculate the density and specific gravity of the rock sample.

LABS - 1 period

REFERENCES - Earth and Space Science - p. 43

MAJOR TOPIC - Rocks Activity #25

PERFORMANCE OBJECTIVE - #2

DESCRIPTION OF ACTIVITY - Test rock sample with ultraviolet light

LABS - 1/2 period

REFERENCES - Rocks and Minerals - p. 22

MAJOR TOPIC - Rocks Activity #26

PERFORMANCE OBJECTIVE - #2

DESCRIPTION OF ACTIVITY - Show and discuss film - The Hidden Earth

LABS - 1 period

REFERENCES - Dade County AV#1-30358, 29' C

MAJOR TOPIC - Rockets Activity #27

PERFORMANCE OBJECTIVE - #4

DESCRIPTION OF ACTIVITY - Construct a chart or map showing size of each planet and their distance from the sun.

LABS - 1 period

MAJOR TOPIC - Rockets Activity #28

PERFORMANCE OBJECTIVE - #4

DESCRIPTION OF ACTIVITY - Record for two weeks the time of sunset and sunrise. Observe the change in the length of daylight hours. Times can be found in the newspaper.

LABS - 1 period

REFERENCES - Earth and Space Science - p. 248

MAJOR TOPIC - Rockets Activity #29

PERFORMANCE OBJECTIVE - #4

DESCRIPTION OF ACTIVITY - Show and discuss film - Our Mr. Sun Part I and Part II

LABS - 2 periods

REFERENCES - Dade County AV#1-30622 and 1-30625 Each 33' C

MAJOR TOPIC - Rockets Activity #30

PERFORMANCE OBJECTIVE - #4

DESCRIPTION OF ACTIVITY - Show and discuss film - Exploring the Moon

LABS - 1/2 period

REFERENCES - Dade County AV#1-10639, 16' C

MAJOR TOPIC - Rockets Activity #31

PERFORMANCE OBJECTIVE - #4

DESCRIPTION OF ACTIVITY - Place a 100 watt bulb in the center of the room. Stand near the light. Have someone revolve a ball around the room keeping the same side of the ball facing the light. Students will see the phases of the moon.

LABS - 1/2 period

REFERENCES - Science - p. 207

MAJOR TOPIC - Rockets Activity #32

PERFORMANCE OBJECTIVE - #4

DESCRIPTION OF ACTIVITY - Show and discuss slides - Astronomy: Stars and Planets

LABS - 1 period

REFERENCES - Dade County AV#5-20097, 30 (2x2)

MAJOR TOPIC - Rockets Activity #33

PERFORMANCE OBJECTIVE - #4

DESCRIPTION OF ACTIVITY - Show and discuss film - Exploring the Night Sky

LABS - 1/2 period

REFERENCES - Dade County AV#1-01604, 10' BW

MAJOR TOPIC - Rockets Activity #34

PERFORMANCE OBJECTIVE - #5

DESCRIPTION OF ACTIVITY - Show and discuss film - Rockets: How They Work

LABS - 1/2 period

REFERENCES - Dade County AV#1-11424, 16' BW

MAJOR TOPIC - Rockets Activity #35

PERFORMANCE OBJECTIVE - #5

DESCRIPTION OF ACTIVITY - Show and discuss film - Rockets: Principles and Safety

LABS - 1/2 period

REFERENCES - Dade County AV#1-03556, 11' C

MAJOR TOPIC - Rockets Activity #36

PERFORMANCE OBJECTIVE - #5

DESCRIPTION OF ACTIVITY - Construct an apparatus to illustrate a dust explosion. Place a burning candle into a metal container (coffee can). Then blow dry corn starch across flame.

LABS - 1 period

REFERENCES - Experiments in the Principles of Space Travel - pp. 44-45

MAJOR TOPIC - Rockets Activity #37

PERFORMANCE OBJECTIVE - #5

DESCRIPTION OF ACTIVITY - Have a student stand on a "twister platform" or sit on a swivel chair. Give the student a spinning bike wheel to hold. When another student tries to turn the student on the chair, gyro-stability will be illustrated.

LABS - 1 period

MAJOR TOPIC - Rockets Activity #38

PERFORMANCE OBJECTIVE - #5

DESCRIPTION OF ACTIVITY - Show and discuss film - Exploring Space

LABS - 1 period

REFERENCES - Dade County AV#1-30737, 25' C

MAJOR TOPIC - Rockets Activity #39

PERFORMANCE OBJECTIVE - #5

DESCRIPTION OF ACTIVITY - Place a small balloon or another air tight container under a bell jar and pump air out of the bell jar.

LABS - 1/2 period

MAJOR TOPIC – Rockets Activity #40

PERFORMANCE OBJECTIVE – #5

DESCRIPTION OF ACTIVITY – Arrange soup cans partially filled with water. Paint or cover cans with reflecting or insulating materials. Shine a heat lamp on the cans and record the temperature of the water in each can.

LABS – 1 period

REFERENCES – Experiments in the Principles of Space Travel – pp. 68–73

MAJOR TOPIC – Reactions Activity #41

PERFORMANCE OBJECTIVE – #6

DESCRIPTION OF ACTIVITY – Perform Experiments on pages 18–19 of The Golden Book of Chemistry Experiments

LABS – 1 period

REFERENCES – The Golden Book of Chemistry Experiments

MAJOR TOPIC – Reactions Activity #42

PERFORMANCE OBJECTIVE – #6

DESCRIPTION OF ACTIVITY – Show and discuss film – Chemical Change

LABS – 1/2 period

REFERENCES – Dade County AV#1-10910, 12' C

MAJOR TOPIC - Reactions Activity #43

PERFORMANCE OBJECTIVE - #6

DESCRIPTION OF ACTIVITY - Show and discuss film - Chemical Changes All About Us

LABS - 1/2 period

REFERENCES - Dade County AV#1--10914, 14' C

MAJOR TOPIC - Reactions Activity #44

PERFORMANCE OBJECTIVE - #6

DESCRIPTION OF ACTIVITY - Make a chart listing some common elements. Have the students look up the atomic number, atomic weight and symbols.

LABS - 1 period

MAJOR TOPIC - Reactions Activity #45

PERFORMANCE OBJECTIVE - #6

DESCRIPTION OF ACTIVITY - Make a chart listing some common compounds. Have the students fill in the formula and name the compounds.

LABS - 1 period

MAJOR TOPIC - Reactions Activity #46

PERFORMANCE OBJECTIVE - #6

DESCRIPTION OF ACTIVITY - Show and discuss film - Properties of Water

LABS - 1/2 period

REFERENCES - Dade County AV#1-01965, 10' BW

MAJOR TOPIC - Reactions Activity #47

PERFORMANCE OBJECTIVE - #6

DESCRIPTION OF ACTIVITY - Electrolysis of water. Test each gas sample with a glowing splint.

LABS - 1 period

REFERENCES - The Golden Book of Chemistry Experiments

MAJOR TOPIC - Reactions Activity #48

PERFORMANCE OBJECTIVE - #6

DESCRIPTION OF ACTIVITY - Show and discuss film - Oxygen

LABS - 1/2 period

REFERENCES - Dade County AV#1-01970, 10' BW

MAJOR TOPIC - Reactions Activity #49

PERFORMANCE OBJECTIVE - Invert a jar over a burning candle in a dish of water. When the candle goes out and the water rises in the jar, mark the water level and calculate what percentage of the jar was filled with water.

LABS - 1/2 - 1 period

REFERENCES - The Golden Book of Chemistry Experiments - pp. 26-27

MAJOR TOPIC - Reactions Activity #50

PERFORMANCE OBJECTIVE - #6

DESCRIPTION OF ACTIVITY - Show and discuss film - Hydrogen

LABS - 1/2 period

REFERENCES - Dade County AV#1-10939 14' C

MAJOR TOPIC - Reactions Activity #51

PERFORMANCE OBJECTIVE - #6

DESCRIPTION OF ACTIVITY - Show and discuss film - Properties of Acids and Bases

LABS - 1 period

REFERENCES - Dade County AV#1-30347, 28' C

MAJOR TOPIC - Reactions Activity #52

PERFORMANCE OBJECTIVE - #6

DESCRIPTION OF ACTIVITY - Perform tests for acids and bases described on pages 42-43 of The Golden Book of Chemistry Experiments

LABS - 1 period

REFERENCES - The Golden Book of Chemistry Experiments pp. 42-43

MAJOR TOPIC - Activity #53

PERFORMANCE OBJECTIVE - #6

DESCRIPTION OF ACTIVITY - Neutralize an acid with a base and evaporate the liquid leaving a salt.

LABS - 2 - 1/2 periods

REFERENCES - The Golden Book of Chemistry Experiments pp. 46-47

MAJOR TOPIC - Reactions Activity #54

PERFORMANCE OBJECTIVE - #6

DESCRIPTION OF ACTIVITY - Show and discuss film - Carbon and Its Compounds

LABS - 1/2 period

REFERENCES - Dade County AV#1-01968, 10' BW